Data Quality Objectives Process Worksheet

EPA has developed a seven-step Data Quality Objectives procedure that is designed to ensure that sampling and analysis plans are carefully thought out and that the results of the effort will be adequate to meet the basic objectives of the program.

1. **State the Problem** – Summarize the contamination problem that will require new environmental data, and identify the resources available to resolve the problem.

Problem:
Asbestos-containing material (ACM) resulting from building demolitions is scattered across and buried under residential properties at North Ridge Estates, Klamath Falls, Oregon. The extent to which this ACM poses a threat to human health has not yet been determined; however, the material is known to contain chrysotile and other forms of asbestos. The ACM that remains on the site consists of building materials, generally concrete asbestos board (CAB), roofing tiles, and steam pipe insulation. The steam pipe containing asbestos insulation was routed across the site, but in most instances remains buried several feet below ground surface.

During the summer and fall of 2003, EPA's emergency response program performed a surficial removal action, identified "hot spots" and burial pits, performed XRF screening for lead, collected ambient air samples across the site and at every residence (both inside and outside), and collected soil and dust samples. The purpose of these activities was to remove materials that were readily available and potentially posed a threat to health and also to begin to collect data to understand the extent to which residents currently living at the site were being exposed to friable asbestos fibers.

In light of EPA's experience at other asbestos sites across the country, an additional sampling activity – task-based monitoring – was recommended to better represent exposures that individuals who reside at North Ridge Estates may experience. (For example, at a public meeting one resident asked if it was o.k. to weed whack their yard.) The purpose of this document is to outline the data needs to address these types of exposures and develop a protocol to perform task-based monitoring at the North Ridge Estates site.

Planning Team:

Dan Heister, EPA Region 10, On-Scene Coordinator
Bill Mehnert, Superfund Technical Assessment and Response Team (START), Project Manager
Julie Wroble, EPA Region 10, Toxicologist

Resources:

- Who to prepare DQO worksheet (me?) and Sampling and Analysis Plan (Bill? Me?)
- Equipment used for this project will be a combination of EPA-owned and rental equipment
- A contract analytical laboratory will be used for the project along with Susan Davis in the field?
- Others?

2. **Identify the Decision** – Identify the decision that requires new environmental data to address the contamination problem.

Principal study questions:

1. Do soils on site that contain ACM release free fibers to air when disturbed *in situ*?
2. When residents disturb soils on site that contain ACM, are they exposed to asbestos fibers in air? If so, at what levels? Is there a correlation between the type of activity and level of exposure?

Alternative actions that could result from resolution of study questions

1. If soils that contain ACM release free fibers to air above an action level, then mitigation may be necessary at North Ridge Estates.

2. If soils that contain ACM do not release free fibers to air above an action level, then no further action may be required.

Decision Statements:

1. Determine if measurable quantities of fibers are released from soil during a variety of soil-disturbing activities.
2. Determine the types, properties, and concentrations of fibers released.
3. Determine whether different activities result in different levels of fibers released.

3. **Identify Inputs to the Decision** – Identify the information needed to support the decision and specify which inputs required new environmental data.

Information required to resolve the decision statements:

1. Identify areas on site where ACM is present and fibers have been identified in the soil matrix.
2. Measure the levels of asbestos in air for a variety of activities.

Sources of information:

1. Data collected previously on site, including, but not limited to: soil elutriator results, soil glove box results, and field observations.
2. Data from the proposed sampling

Information needed to establish the Action Levels:
The planning team has identified several potential action levels for this investigation.

Air Action Levels:
The planning team has determined that use of action levels would be appropriate for the task-based monitoring, recognizing that task-based monitoring results may be quite variable and may not be reproducible.

A description of the calculation of action levels is attached (Appendix A).

Any need to include the AHERA samples for up and downwind monitors? Note that in the raking scenario at Libby, the downwind monitor had hits during the activity. Post-activity monitoring could be used for clearance.

Confirm that appropriate analytical methods exist to provide the necessary data:

Air:

- International Organization for Standardization (ISO) International Standard ISO 10312, Ambient Air – Determination of asbestos fibres – Direct-transfer transmission electronic microscopy method.
- NIOSH Method 7402, Asbestos and Other Fibers by TEM
- PCM field method?
- AHERA?
- Yamate?
- EPA Superfund TEM Method?

The planning team has determined that TEM methods are preferable for this project as they have lower limits of detection in general than light microscopy methods and can identify fiber type.

4. Define the Study Boundaries – Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision.

Characteristics that define the population of interest:

For air, this study is focused on measuring a worst-case concentration scenario; therefore, the characteristic that defines the population of interest is the concentration of asbestos present in the breathing zone of individuals conducting simulated activities in soil containing ACM.

Spatial boundary of the decision statement:
The decision applies to area of the NRE subdivision that are unpaved, have limited vegetative cover, and have not been covered by clean fill (Dan, are there areas on site where "remediation" has occurred?). Further, decisions apply to air within the breathing zone of potentially exposed individuals engaged in activities within or downwind of areas of concern.

Temporal boundary of the decision statement:
Asbestos is stable over time in soil; therefore, conditions documented by the sampling approach are expected to represent site conditions at the time of the sampling and in the future. Asbestos fibers enter the air mainly as a result of resuspension due to mechanical disturbance or wind erosion. Because these forces may vary substantially over time, asbestos levels in the air are also expected to vary substantially over time. However, this sampling event is intended to represent potential exposures subsequent to active soil disturbance. Therefore, conditions documented by the proposed sampling are expected to represent site conditions under similar circumstances of soil disturbance.

Scale of decision-making:
For the task-based monitoring activities described herein, a limited number of locations were selected based on prior sampling and knowledge about levels of ACM in soil. Results from this sampling may or may not be applicable to the remainder of the site but may be used to inform decision about the need for or extent of remediation.

Practical constraints on data collection:
Several constraints in data collection could exist:

- Loading of particulate on sampling filters over the sampling period could cause sufficient back pressure to cause the sampling pumps to slow or stop.
- Required sampling times to meet detection levels may exceed pump operation times.
- Inclement weather could preclude task-based monitoring.
- The number of grid openings that require counting to meet the screening action level may be cost-prohibitive.

5. Develop a Decision Rule – Develop a logical "if…then" statement that defines the conditions that would cause the decision maker to choose among alternative actions.

Statistical parameter that defines the population:
The statistical parameter of interest for the soil matrix is the concentration of asbestos in air at each selected location for each activity of interest. The sampling scheme is designed to characterize activity-related exposures for a subset of activities expected to occur at the site. This investigation is focused on potential "worst-case" exposure scenarios associated with specific activities rather than average exposures over time.

The action level for the decision:
As described in Appendix A, the action level for the task-based monitoring results is activity dependent, and also varies depending on whether the current IRIS unit risk factor is used for asbestos or whether the proposed Berman and Crump (2003) unit risk value is used. (include table once finished – discuss with Dan prior to external release)

Confirm that the action level exceeds the measurement detection limits:
For air, the TEM method … has a LOD of xx percent or lower.

To achieve the action level for air, sampling and analysis within the following parameters are required…

Volume sampled (L)				
Number of grid openings counted				
Area of a grid opening (mm2)				
Total area read (mm2) (assuming a 25mm diameter filter with a collection area of 385 mm2)				
Sampling time required (hours) at 7 L/min flow rate				
Sampling time required (hours) at 10 L/min flow rate				
Sensitivity				

Decision rule:

1. If ACM is present in soil at concentrations that result in exceedence of an action level for a specific activity, then some type of mitigation may be warranted. In the case where some, but not all of the locations tested exhibit exceedences, then further study may be warranted to determine the extent of the problem. In the case where none of the locations tested exhibit exceedences, then mitigation may not be required. However, this information is being considered with the results of prior sampling performed at the site.

6. Specify the Limits on Decision Errors – Specify the decision makers' acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.

<u>For the air investigation:</u>

Determine the range of parameters of interest:

The possible range of parameters of interest is not known. However, the range of interest is near the action level, non-detect to three times the action level. Sampling should be designed to maximize air disturbance and circulation to entrain fibers and keep them entrained over the sampling period. This should establish fairly homogeneous fiber distribution.

Define both types of decision errors and establish the true nature for each decision error:

1) Decide that the level of asbestos in an area of concern does not exceed the activity-specific action level when, in fact, it does.
2) Decide that the level of asbestos in an area of concern does exceed the activity-specific action level when, in fact, it does not.

The first decision error could occur as a result of measurement error (e.g., the results of analysis erroneously reports asbestos concentration and density below the action level) or sampling error (e.g., air circulation patters resulted in heterogeneous distribution of asbestos, disturbance of asbestos was inadequate to entrain the fibers in air for sampling, sample pumps failed to operate within the required flow rate and collection time parameters). The second decision error could occur as a result of measurement error (e.g., the analytical results erroneously report asbestos concentration and density at or exceeding the site screening levels) or sampling error (e.g., air circulation patterns resulted in heterogeneous distribution of asbestos, sample pumps failed to operate within the required flow rate and collection time parameters). – reproducibility of activities from site to site? Impact of one activity on another? Others?

Consequences of the decision errors:

1) This decision error could result in a threat to human health and environment.
2) This decision error could result in unnecessary expenditures for further assessment and/or mitigation.

Establish which decision error has the more severe consequences near the action level:

Decision error 1 has the more severe consequences near the action level.

Define the baseline conditions:

Ho = The concentration of asbestos is greater than or equal to the site action level.
Ha = The concentration of asbestos is less than the site action level.

A false negative occurs when the null hypothesis is falsely accepted. In this case, a false negative would occur when the decision maker determines that the concentration of asbestos exceeds the action level, when, in fact, it does not. A false positive occurs when the null hypothesis is falsely rejected. In this case, a false positive would occur when the decision maker determines that the concentration of asbestos is not greater than the action level when, in fact, it is.

Range of possible parameters where the consequences of a false negative decision error are relatively minor (Grey region):
50 to 100 percent of the action level.

Tolerability probability for decision errors:
Judgmental sampling precludes assessment of decision errors due to sampling error. Measurement error is the only statistically assessable component of decision error for this Decision Rule. Definitive data will be required, with its required QA/QC, to limit measurement error.

Decision Error Limit Table, where standard deviation is 50% of AL and range is 0-200% of AL

True Concentration (% of AL)	Decision Error Probability Goal (%)	Type of Decision Error
25	0.1	False Negative
50	0.25	False Negative
50-100	Grey Area	Grey Area
100	0.25	False Positive
200	0.1	False Positive

7. Optimize the Design for Obtaining Data – Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.

All specific planning and activities will be documented in a Sampling and Analysis Plan (SAP). A record of sampling activities will also be documented in the EPA/START field log book. All analytical QA/QC and documentation specified in the EPA/START SAP will be performed.

Sample design for the air investigation will be based, in part, on results from the soil sampling completed in the fall of 2003. Because the goal of the air sampling is to determine, under worst-case conditions, if individuals are exposed to harmful levels of fibers in air, sampling will be conducted in areas with high amounts of ACM in soil and correspondingly high levels of fibers.

At each of 4 areas, 3 different activities will be conducted. The person conducting each activity will wear a personal monitoring pump. Samples collected in such a manner likely are more representative of personal exposures to asbestos as compared with stationary sampling pumps. For this sampling event, the goal is to understand which activities result in increased exposures and if those activities result in unacceptable risks to the individuals performing them.

Notes from meetings/calls:

We are in the processing of developing a limited task-based monitoring approach for the North Ridge Estates site and are using the QAPP (March 2001) and Vermiculite NW Phase III approach as starting points. As we discussed the plan for Libby, we had several questions. I'm hoping that one or both of you can be of assistance.

1. Have the results of the garden rototilling study been released? If not externally, is there a version I can review?

2. Did you perform the outdoor activities within an enclosure? If so, can you provide the specifics?
   AM says no enclosure was used…

3. Were the aerosol monitors useful? How were these data used?
   Could these be useful for truthing Wayne's modeling

4. Did the upwind and downwind stationary monitors pick up significant levels of fibers relative to the personal monitors?
   Raking did not result in hits, but leaf blowing did.

Any suggestions for improving the study design? I'm hoping to get this information quickly as I'd like to draft a plan by the end of next week (March 5).

Briefly, as I understand it, we have agreed to limited task-based monitoring at North Ridge to address people's concerns about whether certain activites are safe, given the ACM scattered across the site. Specifically, children playing in the dirt and week whacking were specifically identified as exposures of concern. In addition, we would consider using a ditch witch to address concerns about future utility work or construction scenarios. Other scenarios may still be up for consideration.

At this point, we proposed conducting field work in the summer at up to 4 locations across the site to simulate activities identified above and obtain data. While I realize this study is very limited, it may help to "truth" the modeling being done by Dr. Berman using elutriator data and the glove box results we're collecting.

The data set for this site also includes ambient air data, indoor and outdoor residential ambient air samples, limited personal air data for specific high-contact activities, and XRF soil data for lead.

Dr. Berman has performed a risk analysis on the air data collected to date and also has drafted a risk assessment using the elutriator data available as of Nov. 2003. Initial results were encouraging (i.e., risks were low), but I had serious concerns about the emissions modeling done with the elutriator data. The next version of this report will include the complete soil/elutriator data set that the PRPs collected and additional details relating to the modeling and risk assessment. EPA also is collecting elutriator and glove box data for specific residences (from soil composites) and hot spots (as discrete samples). Ultimately, these data and results from the task-based modeling will be incorporated into or amended onto the site risk assessment.

Notes from Aubrey:
ISO versus AHERA….
ISO is better for characterization, differences with complex structures, matrices. ISO handles higher order complexes better.

For Libby, AHERA identified only 60% of structures viewed by ISO. PCME only gets 28% of structures identified by ISO.

Based on the soil results, we'll select 3-4 locations. (limit variability)